# In-vehicle AI

## All those in favor of smarter cockpits say AI

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Hardly a day has passed recently without the progress Artificial Intelligence (AI) is making garnering press attention throughout the world. Of course, AI has also attracted substantive coverage in automotive around autonomous vehicles. Less well known is AI's use case in the field of vehicle interiors, particularly around In-Vehicle-Infotainment and the in-cabin experience.

With reports that consumers are starting to push back against the vogue for sleek looking, but frustrating to use, in-vehicle interfaces AI is set to be the vehicle interior designer's secret weapon. AI could succeed in making more drivers and passengers receptive to their minimalist interiors and could banish buttons forever.

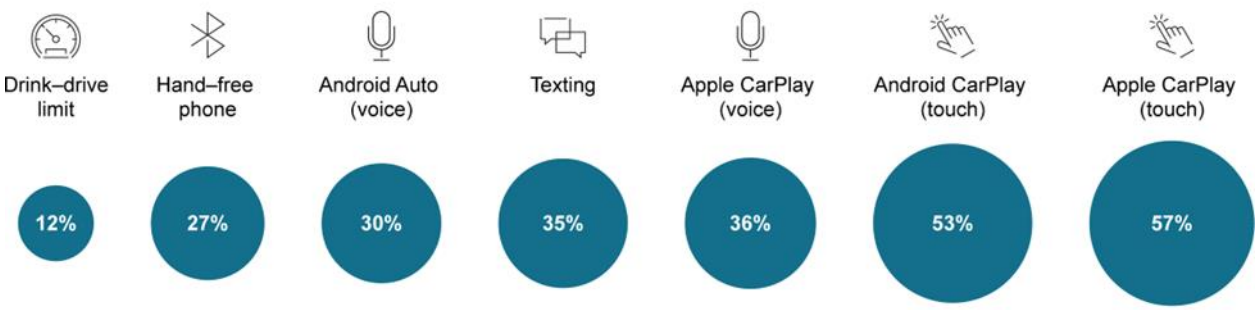
AI refers to developing computer systems that can perform tasks that typically require human intelligence, such as perception, recognition, and decision-making. In modern vehicles, AI is used to automate driving tasks, assist with navigation, and provide a more personalized and intuitive user experience. A recent S&P Global market study shows how AI and machine learning (ML)-powered Infotainment 'Headunit' systems enhance many other applications as well as vehicle personalization.

For example, AI and ML help in improving the accuracy, efficiency, and scalability of GPS navigation mapping by using various sources of data, such as satellite imagery, GPS, sensors, cameras, and user feedback. AL and ML also help in optimizing routing by using advanced algorithms, such as neural networks and reinforcement learning. Using these advanced algorithms navigation systems can perform superior traffic flow prediction, recommend alternative routes, and adjust the routes based on user feedback.

In-vehicle facial and speech recognition also draw heavily on AI. Advanced conversational AI technology eliminates many low-accuracy Infotainment tasks and executes them automatically using situation aware HMI algorithms. In addition to providing convenience and efficiency to drivers and passengers, voice-enabled commerce opportunities have started to give automakers a way to generate revenue and a return-on-investment on their voice AI spend. For example, the Mercedes-Benz MBUX voice control system can be used by registered users to 'buy concert tickets' or 'pre-ordering coffee' from a retail shop.

With powerful computing processing platforms at the back together with gaming engines, AI is progressing in the Infotainment space at a terrific rate. For example, BMW's iDrive 8 system uses natural language processing, gesture control, and ML to connect the vehicle and drive in more intuitive, personal, and emotional ways. Furthermore, BMW's Intelligent Personal Assistant, a kind of AI human that lives in the vehicle cockpit, helps with many driving-related tasks. Instead of swiping through screens looking for options, a user simply speaks — ask for directions, change the temperature, play a movie for the kids in the back seat, request a podcast, and more. Advancements in AI speech recognition, natural language processing, and text-to-speech makes operating these cockpits easier than ever. Moreover, AI enables personalized infotainment systems with customized car settings, content, and recommendations that learn from a user's preferences and habits over time. For example, AI-powered infotainment systems could know the exact song to play to soothe drivers' nerves after a stressful day. All these advanced features not only make the driving experience enjoyable but also a safe one by allowing drivers to stay focused on the road ahead (eyes on the road and hands on the steering wheel) rather than the Infotainment screen. Furthermore, AI improves Infotainment and telematics systems that adapt to driver preferences and behavior.

**How drivers' reaction times slow**



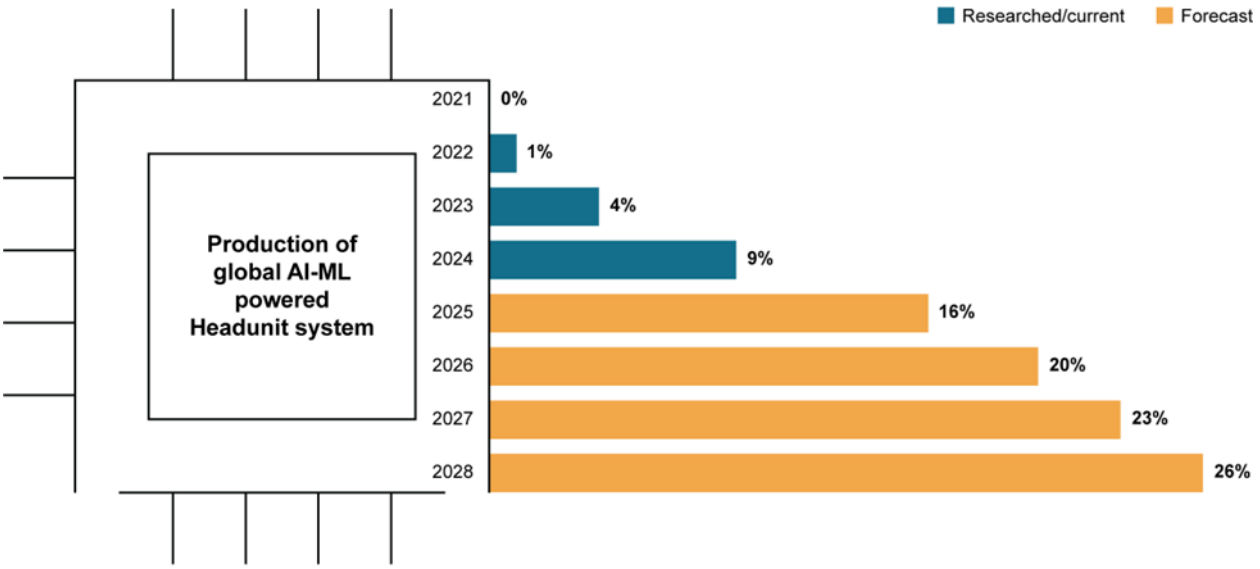

As of May 3, 2023.
The data here illustrates percentage increase in distracted drivers' response time. An undistracted driver typically reacts in 1 seconds.
Source: S&P Global (data obtained from Transport Research Lab - UK).


## Growth forecast for AI-ML based Infotainment Headunit system

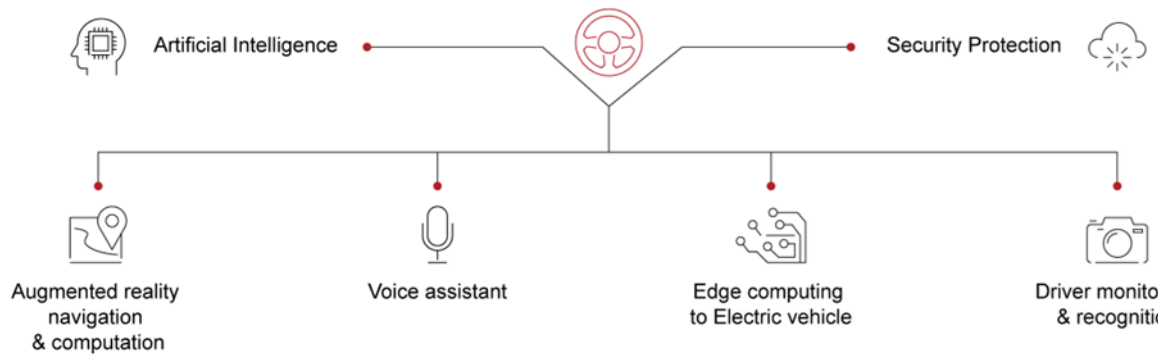
With a compound annual growth rate of 104%, AI-ML powered Infotainment head unit systems will see significant market growth between 2021 and 2028. Two prime factors are fueling the growth:

- AI integration on voice recognition: Voice control and AI features are becoming more popular and expected in modern infotainment systems. All OEMs are actively engaged in Infotainment Headunit software development to integrate AI for enhancing voice recognition capability. Although many of the automakers are implementing intelligent voice with natural speech with the help of vehicle modems (e.g., Amazon Alexa's voice), this trend will start to reverse in the longer term when automakers will start to implement their own in-vehicle AI-ML processed intelligent voice.
- AI-powered augmented reality (AR) navigation: AR technology in vehicles is used to provide enriched information about the surroundings of the vehicle environment. The interest in AR navigation is increasing and several automakers are providing AR functionality in their newer vehicle models, for example, Mercedes-Benz MBUX Augmented Reality Navigation, Changan AR etc. Several other automakers have started developing AR navigation and the market will start witnessing a flurry of OEMs with this technology by 2025 and 2026.

**In-Vehicle Infotainment Headunit software application trends 2021–28**




Demand for AI-ML features depicts a double-digit growth between 2021 and 2028 fuelled by intelligent applications such as AR navigation, intelligent voice assistant, Edge computing, and driver monitoring




As of May 05, 2023.
Source: S&P Global (data obtained from Transport Research Lab - UK).


AI is enabling a range of new software-defined, in-vehicle capabilities within vehicle interior systems that were not possible before. For example, Blackberry and Marelli Power jointly developing a software-defined audio solution that will create individual sound zones, and voice recognition across multiple zones within the vehicle with improved noise cancellation for a better-managed acoustic experience. Furthermore, an AI-powered cockpit with the help of 'Over-The-Air' (OTA) facilitates a highly customizable in-cabin experience that can be continually upgraded over the vehicle's lifetime. Automakers have started to reap the benefit of AI-based Head Units with new revenues by utilizing OTA features that allow customers to personalize Infotainment media, navigation, and other interior features. S&P market data shows the trend on combined OTA and AI featured Head units will grow ten-fold by 2025 and 2026.

## S&P Global Mobility Software Vehicle Domain – Head Unit Dashboard & Query Tool datasets

For automotive and software professionals wanting to explore the trends outlined above, and go deeper in uncovering insights and opportunities, the Supply Chain Technology division within S&P Global Mobility offers a new product to support these needs. Incorporating an extensive database, together with an interactive analytics dashboard, it brings together software technical details, in-vehicle infotainment applications and OEM software development strategies in a way that's not been accessible before.

The new portal offers analysis into cockpit software development together with specification analysis on:

- AI and Neural processing
- 3D animated graphics
- Gaming and human-machine interfaces (HMI) development engines
- Application programming interfaces (API) for HMI development
- Security and encryption features
- Ethernet high bandwidth communication penetration

It also explores automaker software development strategies using key market intelligence data including:

- Technology and consortium partnerships
- Key supply chain relationships
- Forecasts for future in-house software development capabilities

In addition to the above, users can also develop their software development scenarios with user-defined inputs and further analyze market penetration of key technology features including growth and development spending scenarios.

For further information:

- https://autotechinsightda.ihsmarkit.com/dashboard-forecasts/analysis-tool
- https://autotechinsight.ihsmarkit.com/services/46441/software

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